



See a flexible battery for smart contact lenses

S. Himmelstein | September 06, 2023

NTU scientists develop tear-...



Vision correction and health monitoring are just some of the services provided by smart contact lens technology. Future iterations of the technology could enable users to transmit data from their immediate environment to cloud-based data storage. Expanded deployment of these smart wearables is dependent on the availability of a safe, efficient and non-wired battery and suitable battery to power the devices. Enter researchers from Singapore's Nanyang Technological University, who engineered a thin, flexible battery that stores electricity when immersed in saline solution.

The tear-based battery eliminates the need for metal electrodes in the contact lens, which could prove harmful to the wearer. The new battery also removes the need to encumber the user with power transmission equipment as is required with induction charging systems.

A biocompatible copper hexacyanoferrate cathode and polypyrrole anode are fabricated on a porous paper substrate to

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impart flexibility and strength. To test its performance, the battery was bio-charged in a glucose-based charging solution to simulate the storage of the contact lens charging at night, before being discharged in an artificial tear solution to simulate its use in the daytime. The enzymatic reaction of the glucose and the battery materials yields an electrical charge.

The device demonstrated a discharging capacity of $45 \mu\text{A}/\text{cm}^2$ and a maximum power of $201 \mu\text{W}/\text{cm}^2$, with its performance verified over 15 cycles. The battery [described in Nano Energy](#) could also be powered by human tears as they contain the requisite sodium and potassium ions to react with the glucose-coating and generate power. The battery can also be charged conventionally by an external power supply.

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